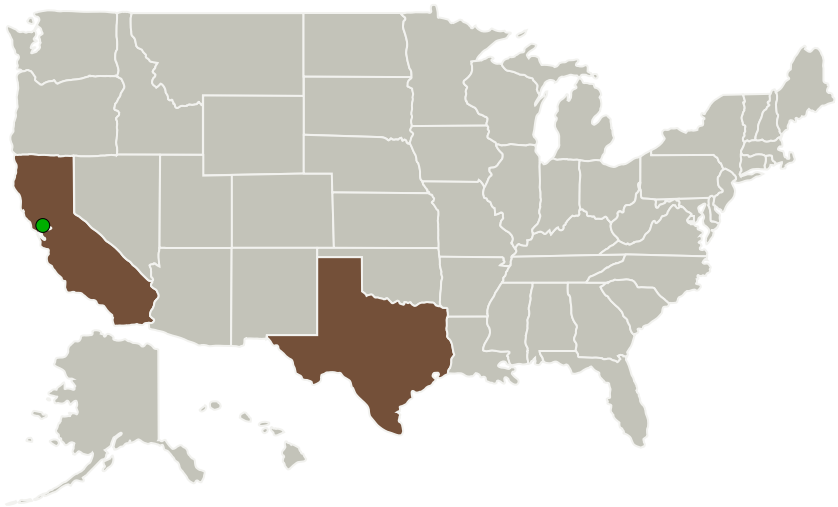
A Low Power Terabit Laser-Modulator Array, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

Technical abstract: Ultra scale computing for large-Scale Numerical Simulation requires a new technology for optical communication. VCSELs run out of bandwidth at 56 Gb/s PAM4, and the latency of PAM4 is incompatible with super-computing. Other available technologies are excessively expensive, have high power consumption, are far from proven or they require temperature control. The proposed concept integrates an Electro-Absorption Modulator (EAM) with a Surface-Emitting (SE) laser capable of > 100 Gb/channel NRZ which can be arrayed to > 1 Tb/s for a 10 element array. Using NRZ instead of a more complex format reduces latency dramatically. The proposed device can operate over a wide temperature range, at least 25 C to 125 C and potentially over the full military range without temperature control. The EAM SE laser has a 30% reduction in power per bit compared to VCSEL solutions, and the transmission distance is dramatically improved. The proposed low cost device can be manufactured by the billions. The EAM SE laser array can be flip-chip mounted onto silicon.. This unique device has ten times the reach of VCSELs, more than sufficient for any data center or super computer. The EAM SE laser is made from elements which are already proven and understood, but put together in a manner which achieves the performance ultra-scale computing needs.

Primary U.S. Work Locations and Key Partners



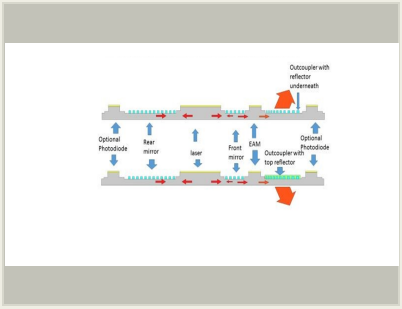


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

A Low Power Terabit Laser-Modulator Array, Phase I

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Organizations Performing Work	Role	Type	Location
Photon Sciences, Inc.	Lead Organization	Industry	Plano, Texas
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Texas

Project Transitions

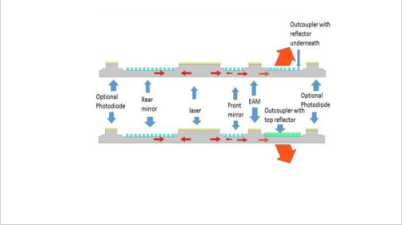
June 2016: Project Start

December 2016: Closed out

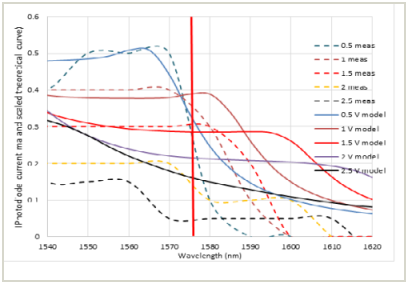
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139789)*

Images



Briefing Chart Image
A Low Power Terabit Laser-Modulator Array, Phase I *(https://techport.nasa.gov/image/131927)*



Final Summary Chart Image
A Low Power Terabit Laser-Modulator Array, Phase I Project Image *(https://techport.nasa.gov/image/130007)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Photon Sciences, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

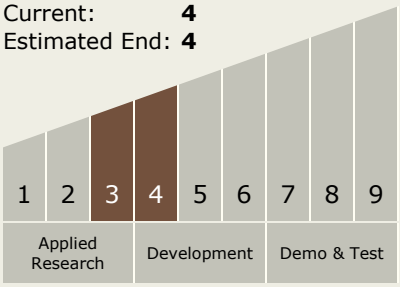
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Ralph H Johnson

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.2 Electro-Mechanical, Mechanical, and Micromechanisms

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System